Smart Garbage Monitoring System

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Abstract - *Garbage Management is one of the primary problems that is faced throughout the world. With rapid increase in population, the issue related to sanitation with respect to garbage management are degrading immensely. To avoid this problem, IoT based Smart Garbage Monitoring System is the best and trending solution. Due to the Garbage there are chances of unhygienic gases, which is harmful for human being. To avoid such situations one solution is smart garbage monitoring system are develop. This system gives the notifications to higher authority person to take certain actions. The smart bin system was tested in an outdoor environment. Through the test, we collected data and applied sense making methods to obtain liter bin utilization and liter bin daily seasonality information. This system will monitor the dry and wet garbage.*

Keywords — *Garbage, Microcontroller, IoT, Wireless Sensor, Smart Cities, Garbage Collector, Wi-Fi module*

I. INTRODUCTION[1]

Smart Garbage Monitoring System is the IoT based implementation of project. In our surrounding we see that the garbage consist of unwanted and harmful things left over cities, societies, colleges, public area etc, because of these harmful gases are spread which leads to various diseases in the surrounding environment.

This project is related to the "Smart garbage monitoring system using internet of things." So for smart lifestyle, cleanliness is required. Worldwide interest in Smart Cities has the need to find effective remedies to the major challenges foreseen for the next years. As one of the application of Smart City, Garbage Management in a city is a formidable challenge faced by the public administration. This Garbage Monitoring system will Check the level of dustbin according to that give the notification about bin to respective authority person. Smart Garbage monitoring System using IoT is done using Ardunio uno for Communicate with other hardware part. Another approach using ultrasonic sensor is used to detect the level of garbage inside bin and another is Gas sensor to detect the hazardous gases.

II. LITERATURE SURVEY

A smart dustbin proposed by author, based on IoT in which the smart bin was built on a platform which was based on arduino uno board which was interface with a GSM modem and ultrasonic sensor. The sensor was placed on the top of the bin. A threshold label was set as 1m.As the garbage reaches the level of threshold , the sensors triggers the GSM modem which alerts the associated authority till the garbage in the bin is emptied.

The bin was interfaced with a system based on microcontroller which had IR wireless system with a central system that showed a current status of the garbage in the bin. The status was seen on mobile based web browser with a html page by using wifi. To reduce the cost, they only used weight based sensors and on the sender's side they only used the wifi module to send and received the data.

The manual waste collection and management approach has problems such as lack of information about the collecting time and place. Because of this it is time consuming and less effective i.e. trucks go and may get empty garbage bin.

III. PROBLEM STATEMENTS

Now a day in many cities condition of bins are very bad. The Garbage in the bins are overflowed and also spelled out of the bin. Many people also throwing garbage in that overflowed bin. Due to this uncleaness of cities due to garbage, It is bad for human and environment also. This create very bad look of cities which is one of the way of pollution.

To implement system which automatically open dustbin when anyone wants to throw garbage, also the system which checks level of dustbin wheather it is full or not and accordingly send the message to respective authorities.

The system which shows location of next nearest dustbin to the citizens, which will helps them to find next empty dustbin. To detect dry and wet waste and to implement system which detect biogas and inform authority to take required action.

Iv. Specific objectives

1. To implement system which automatically open dustbin when anyone wants to throw garbage.
2. To implement system which check wheather level of bin is full or not.
3. To implement system which check wheather level of bin is full or not.
4. To detect dry and wet garbage.
5. To implement system which detect biogas and inform authority to take required action.
6. To detect near location of another dustbin if bin is full.

V. System Architecture

This fig shows the view of system architecture. The Smart Garbage Monitoring System is a very innovative system which will help to keep cities, colleges, societies clean. This system monitor the garbage bin. By using the ultrasonic sensor it detect the level of trash in the bin and accordingly send the message to the respective authority to take the further action. This ultrasonic sensor is placed over the bin so that it can detect the level of garbage and compare it with depth of bin.

Fig.1.System Architecture

Also gas sensor MQ6 is used to detect the harmful gases in the bin. Solenoid valve is used if any harmful gas is detected by gas sensor. Then for primary action chemical sprinkling is done inside the bin and after that secondary action is taken by the respective authority. Wi-Fi ESP8266 is used for communication purpose between IoT module and web portal. Web page is built to show the status of all the bins and which bins were cleaned. GPS gives the direction of the nearest bin if the current bin is full using LCD display. Whereas moisture sensor is used to detect the dry and wet garbage. All these sensors are controlled through arduino-uno microcontroller.

A. HARDWARE USED

1.Ultrasonic sensor :
Ultrasonic sensor are the main in Smart Garbage Monitoring System. It uses for two main purposes, first is to find out the obstacles which are in the range of this sensor. This helps to automatically open bin when any user want to throw the garbage. Second objective is to detect the level of garbage inside the bin according to level gives notification to respective person. It emits the ultra sound wave at the frequency of 40KHz in the air and if the object will come in its way then it will bounce back to the sensor. Distance can be measured by Distance = Time * sound speed / 2. Where Time = the time between an ultrasonic wave is received and transmitted. It has four pins. Two are VCC and GND which will be connected to the 5V and the ground of the arduino while the other two pins are Trig and Echo pins. The trig pin will send the signal and echo pin will be used to receive the signal. To generate an

ultrasound signal, you will have to make the trig pin high for about 10us which will send a 8 cycle sonic burst at the speed of Ultrasonic sensor shown in the figure.

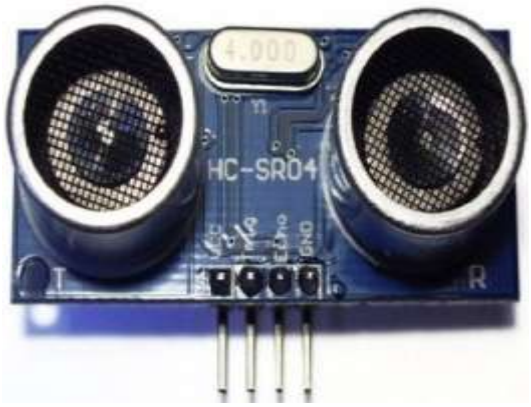

Fig.2.Ultrasonic Sensor

2. IR Sensor:

IR stands for Infrared sensor, it is one type of electronic device sense according to its surroundings. It also measure the heat of particular object. According to the output of this system the value of IR sensor goes down to particular prediction of the system. It helps the WI-FI module for communication purpose. It also detect the voltage. This is one type of passive sensor.

Fig.3 .IR Sensor

3. Gas Sensor:

This sensor consist total four pins VCC, Ground, Digital Out, Analog Out. VCC is used to powered the sensor foe working. Generally the voltage is +5 volt. Ground to connect the garbage monitoring system to ground. Digital out pin is use to get digital output from this pin, by setting a threshold value using the potentiometer. Analog out pin outputs 0-5V analog voltage based on the intensity of the gas .The special use of this sensor is detect the gas which are generated inside the bin. According to that gives notification to respective authority person to take further actions.

Fig.4 Gas Sensor

4. Wi-Fi Module:
In Iot system for communication between different hardware and software devices this wi-fi module is useful. It over the large area for communication between this device. Actual communication are possible using wi-fi module. There are various versions of this module. The ESP8266 for all networking function. This ESP8266 is cost effective module. This has powerful processing and storage capabilities.

Fig.5 Wi-Fi Module

5. Solenoid valve:
Solenoid valve is electrochemical device it is use for sprinkling purpose. When unwanted gases are inside bin the chemical sprinkling are inside bin using this solenoid valve. Due this the chances of desises in public area are totally get reduce.

VI. Relative Methematical module for Proposed system

S = I, P, O, R
S = System
I = Input
O = Output
I = [I0, I1, I2]
I0 = Bin Details
I1 = Admin Details
I2 = Driver Details
P = [P0, P1, P2, P3]
P0 = Receive message from bin to admin
P1 = Schedule and Route
P2 = Send message to driver
P3 = Receive message from admin
O =[O0, O1, O2]
O0 = Scedule which bin first clean
O1 = Route to which bin is close to garbage collector truck
O2 = Clean Bin
To Calculate the Level of Garbage in the Bin:
Distance = (Time * Speed of sound) / 2

VII. ALGORITHMIC SUPPORT

A. Nearest Neighbour:
1. procedure NearestNeighbour(vertex p)
2.queue nodes are sorted, the remaining nodes are sorted by distance
3. result
4. v <- v copy all vertex node into one temp variable
5. while |v|>0 do
6. nodesSorted.rsortRelativeTo(p)

7. result.append(p)
8. p<- result[0]
9. nodesSorted.removeTop()
10. Return result

VIII. SYSTEM WORKFLOW

Fig.6 working structure of system

The entire system consist a transceiver system, means that it involved both the transmitting and receiving units. On implementation process the transmitting part of the system placed along with the garbage bin while the receiving part of the system located at the controlling room of the authorized administrator, at the municipality office Now a days certain actions are taken to improve the level of cleanliness in the country. People are getting more active in doing all the things possible to clean their surroundings. Various movements are also started by the government to increase cleanliness. This Smart Garbage Monitoring System can be implemented which notify to the respective authority about the status of bin. Means that the level of garbage inside the, according to that status of bin like, full or empty will be send through web portal.

This system will help in cleaning the city in a better way. By using this system people do not have to check all the systems manually but they will get a notification when the bin will get filled. Though we have been referring to Smart Cities and communities for some time now, at how use of Information and data available to us can be used to really create some smart services, which in a true sense provide us with better living .Smart City mission is a new initiative taken by Pune Municipal Corporation.

IX. FLOW OF SYSTEM

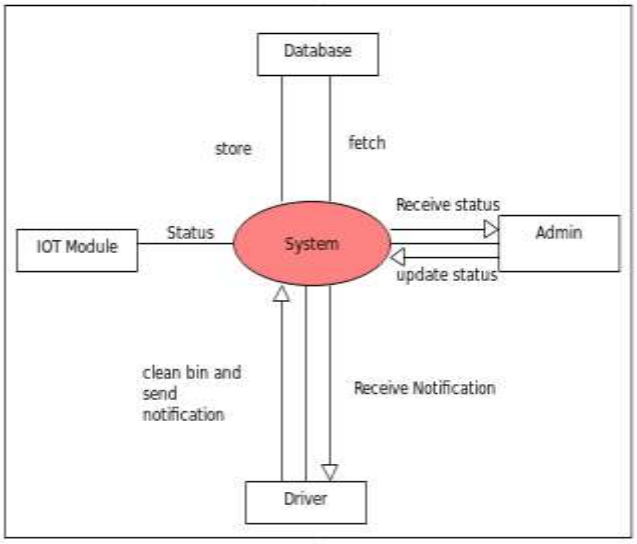

Fig.7 Level 0 Data Flow

In Garbage Monitoring system this figures show the flow of data between software and hardware devices. At data 0 level System remaining on same stage without any changes on it. At the level one actual module are for working purpose. Level 0 shows the hardware flow of the existing system, and level 1 shows the data flow in software system through the web portal. According to given message system gives the notifications.

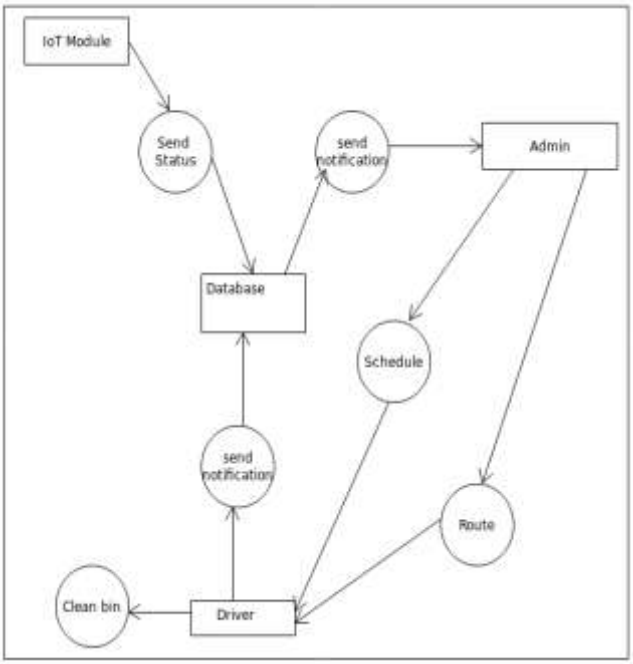

Fig.8 Level 1 Data Flow

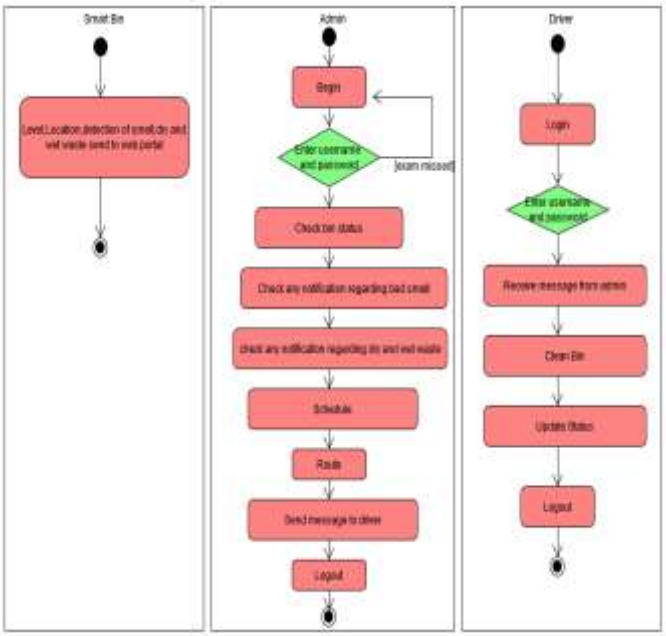

Fig.9 Activity diagram

X. CONCLUSION

As per the goal of this project an attempt to devise an embedded based intelligent alert system is made for proper monitoring and maintenance of the garbage. This system averts the irregular cleaning of the bins and detection of dry and wet garbage by sending alerts to the concerned individual at regular intervals. It further improves the system by additionally endorsing the status of cleaning in real time. it also shows the nearest location of another bin. Thus this system comes in handy as an admirable solution in environmental maintenance.

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